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Analysis of *FARO 44* Rice Technologies Adoption among Farmers in Nigeria

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ABSTRACT

The study examines the adoption of FARO 44 rice among Fadama project particpants. A multistage sampling technique was used to select 336 Fadama project farmers from three agricultural zones. Data collected were analysed using adoption scale and factor analysis as well as frequency and percentages. Majority of males were within the active age of 19-36years; married with farming experience of 16-20 years having 0.5-1ha of rice plot. Technologies such as improved seed recommended spacing; seed per hole; use of granular fertilizer were adopted by male respondents. Processing technologies adopted by male were only threshing and bagging. For storage technologies male respondents had adopted jute bags; rhumbus and silos while female respondents used only jute bags because it is cheaper and easy to handle. Factors constraining adoption were communication gap between farmers and facilitators; untimely delivery of inputs; transplanting too tedious and high cost of false bottom. It was concluded that majority of the technologies were at evaluation and trial stage for both male and female respondents.

Keywords : *Fadama Project; Rhumbus ; FARO; Rice; Factor analysis; Adoption; Nigeria*

INTRODUCTION

"FADAMA" is a Hausa name for irrigable land-usually low-lying plain underlay by shallow aquifers found along Nigeria's major river system. The *Fadama* III Additional Financing a collaborative project of the World Bank, Federal and State Government which has been of immense benefit to farmers in Niger State in Nigeria. The project has greatly enhanced the capacity of farmers, increased their income, boosted their economy and made life more worthy of living (Ibrahim, 2016a). This project has helped to develop the farmers-managed irrigation scheme.

Rice has long become a stable food in the Nigeria food chain. Nigeria no doubt, has natural endowment to be self-sufficient in rice production in less than 5years but has been impeded all a long by conflicting policies and import waivers which permitted large foreign owned rice processing mills to import brown rice from South East Asia thereby exporting badly needed jobs to those countries of import and increasing unemployment locally. Farming is not just an option in Niger State but

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a necessity, considering the vast fertile land and other resources, the state can feed the entire West Africa (Ibrahim, 2016b).

The most important determinants of the effectiveness of research results is the level of adoption of innovation that it generates, and on their profitability (Caswell, 2001). A common problem for many individuals and organization is how to speed up the rate of diffusion of a research program's innovations The main objective of the study is to examine the factor analysis of adoption of FARO 44 rice among Fadama users group (FUGs), describe the socio-economic characteristics of the Fadama user groups and identify constraining factors hindering adoption of FARO 44 rice variety.

METHODOLOGY

The study was conducted in Niger State of Nigeria. Out of twenty-five local governments that made up the state, three local governments namely Katcha (Zone I), Shiroro Zone (II) Wushishi (III) were purposively selected for the study. Their selection were based on the preponderance of Fadama User Groups (FUGs). Multi-stage sampling techniques were adopted for the study. In the first stage two production clusters were selected from each of the zones. In the second stage seven production groups were randomly selected from each of the production cluster and finally four females and four males were interviewed from each of the production groups. This gave a total of 336 respondents. Data were collected from the respondents using structure interview scheduled. Data collected were analyzed using descriptive statistics like mean and percentage. Adoption scale analysis was used to analyse the level of adoption of FARO-44 technologies. Seven point likert scale was adopted to ascertain level of adoption. The scale scores are as follows : unaware (0), aware (1), interest (2), evaluation (3), trial (4), accept (5), reject (6).

Each item will therefore be computed by multiplying the frequency of each response pattern with its appropriate nominal value and dividing the sum with the number of respondents to the item. This is summarized with equation below.

$$XS=\sum\frac{fn}{nr}$$

Where XS= Mean score

$\sum$= Summation

f=frequency

n= Likert nominal value

nr= number of respondents

Any respondent who had mean score of three (3) or greater than mean score is said to adopted FARO 44 Technology for that item while any score below three (3) is said to have rejected the technology in question.

Factor analysis procedure was employed with varimax rotation. The constraints were grouped using principal component analysis with iteration and varimax rotation method. The cut-off point constraint loading was within the range of 0.3-0.5. variables that load in more than one constraint will be discarded following Akinnagbe (2013) and Ibrahim (2016).

The Model is presented in equation..... (1)

$Y_1 = a_{11}X_1 + a_{12}X_2 + **********+a_{1n}X_n$

$Y_2 = a_{21}X_1 + a_{22}X_2 + **********+a_{2n}X_n$

$Y_3 = a_{31}X_1 + a_{32}X_2 + **********+a_{3n}X_n$

*

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$Y_n = a_{n1}X_1 + a_{n2}X_2 + **********+a_{nm}X_n$

Where;

$Y_1, Y_2 \ldots\ldots\ldots Y_2 =$ Observed variable/ constraints to linkage / practice

$a_1 - a_n =$ Constraints to correlation coefficients;

$X_1, X_2, \ldots\ldots\ldots X_n =$ Unobserved underlying factors constraining linkage practice

FINDINGS AND DISCUSSION

Table 1 shows that (64.3%) of males were in the age bracket of 19-36 years which is the active stage of life making it possible to withstand the rigor associated with the farming activities while only 41.7% of their female counterparts were in that age range. About 62.5% of the male respondents had secondary education while only 30.4% of the female counterparts had the same. This means that most of the female respondents were not allowed to continue with their secondary education because of marriage or other reasons. About 83.4% of male respondents had farming experience of 11-20 years while only 32.8% of their female counterparts had the same. This implies that with more experience in farming activities, farmers become less averse to the risk. All (100%) respondents were members of one cooperative or the other. This was possible because the sample was drawn from production clusters. Almost all 98% of the two categories of the respondents cultivated one hectare of land. which may probably be as a results of the *Fadama* III AF package. Majority 68.5% of male respondents had the house hold size of 6-10 persons while only (35.7%) of their female counterparts had same, probably because of

Table 1
Distribution of Respondents according to Socio-economic Characteristics

n=336

Sl. No.	Socio-economic characteristics	Male		Female		Pooled	
		F	%	F	%	F	%
I	Age (years)						
1	1-18	-	-	3	1.8	3	0.9
2	19-36	108	64.3	70	41.7	178	53.0
3	37-54	50	29.8	90	53.6	140	41.7
4	>54	10	6.0	5	3.0	15	4.5
II	Marital status						
1	Single	3	1.8	5	3.0	8	2.4

Sl. No.	Socio-economic characteristics	Male		Female		Pooled	
2	Married	165	98.2	155	92.3	320	95.2
3	Separated	-	-	4	2.3	4	1.2
4	Divorced	-	-	4	2.3	4	1.2
III	**Educational level**						
1	No schooling	3	1.8	25	14.9	28	6.0
2	Primary	55	32.7	90	53.6	145	43.1
3	Secondary	105	62.5	51	30.4	156	46.4
4	Tertiary	5	3.0	2	1.2	7	2.1
IV	**Membership of cooperative**						
1	Member	168	100	168	100	336	100
2	Non-member	-	-	-	-	-	-
V	**Farming experience**						
1	**<5**	-	-	7	4.2	7	2.1
2	5-10	20	11.9	89	53.0	109	32.4
3	11-15	50	29.8	35	20.8	85	25.3
4	16-20	90	53.6	20	12.0	110	32.7
5	21-25	6	3.6	15	9.0	21	6.3
6	26-30	2	1.2	2	1.2	4	1.2
VI	**Farm size (ha)**						
1	0.5-1.0	165	98.2	166	98.8	331	98.5
2	1.1-1.5	3	1.8	2	1.2	5	1.4
VII	**Household size**				-		-
1	0-5	50	29.8	105	62.5	155	46.1
2	6-10	115	68.5	60	35.7	175	52.0
3	11-15	3	1.8	3	1.8	6	1.8
4	>15	-	-	-	-	-	-
VIII	**Occupation**						
1	Full time farmer	165	98.2	128	98.2	293	87.2
2	Part time farmer	3	1.8	40	23.8	43	12.8

the polygamy being practiced in most of the rural farm families in the rural communities. Effiong (2005) reported that a relatively large house hold size enhances the availability of

labour. This implies that adoption cost, risk perception labour requirement and human capital requirements are definitely reduced.

Level of *FARO 44* Variety Adoption Technologies

The results show that recommended improved rice seed had the highest frequency of adoption with a score of 93 for the male famers followed by 66 for recommended spacing of 20 cm by 20 cm. This means that male respondents want to optimize the space and maximize outputs. Recommended quantity of granular fertilizer application had a score of 79. This implies that respondents attach value to granular fertilizer than any other production inputs in the study area apart from improved rice seed. This may probably be attributed to the role fertilizer plays in increasing the output of the farmers.

Table 2
Frequency Distribution of Male and Female respondents by Stages of Adoption of *FARO 44 Rice* Production, Processing and Storage Technologies

Sl. No.	TEC	Una--ware		Aware		Interest		Evaluation		Trial		Ado--ption		Reje--cted		Adoption Mean Score	
I	Production Technologies	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1	IS	0	0	12	19	20	38	13	25	30	32	93	54	0.0	0.0	4.0	3.4
2	TP	12	0	25	29	26	26	25	43	50	41	30	29	0.0	0.0	2.4	3.1
3	DP	31	0	35	25	37	39	30	53	35	30	0.0	21	0.0	0.0	2.0	2.9
4	TD	0	0	30	15	25	25	20	22	44	25	49	44	0.0	0.0	3.3	2.7
5	S	45	36	38	45	27	29	33	44	20	14	5	0.0	0.0	0.0	1.8	1.9
6	RS	0	0	7	6	20	15	35	45	40	35	66	67	0.0	0.0	3.8	3.8
7	SPH	0	0	45	58	25	35	27	25	28	20	43	10	0.0	20	3.0	2.7
8	PB	45	50	54	60	25	30	24	28	20	0.0	0.0	0.0	0.0	0.0	1.4	1.2
9	FAG	0	0	12	30	17	25	25	45	35	33	79	35	0.0	0.0	3.9	3.1
10	FAS	0	0	35	45	47	44	42	37	25	27	19	15	0.0	0.0	2.7	2.5
11	WCM	0	45	35	40	27	33	47	22	33	28	26	0.0	0.0	0.0	2.9	1.7
12	MBS	45	40	35	25	25	37	20	27	15	19	28	20	0.0	0.0	2.1	1.5
13	WM	0	0	15	17	25	47	30	38	40	34	58	32	0.0	0.0	3.6	3.1
14	FAL	0	38	45	40	40	39	30	27	23	24	10	0.0	20	0.0	2.6	1.8
15	FAS	0	44	55	36	45	45	25	21	10	22	13	0.0	20	0.0	2.3	1.6
16	H	0	45	35	38	28	40	45	32	33	13	7	0.0	20	0.0	3.1	1.7
17	R	0	32	35	41	45	34	37	27	31	34	20	0.0	0.0	0.0	2.7	1.9
II	Processing Technologies																
1	T	0	0	25	29	15	35	25	82	20	12	83	10	0.0	0.0	3.7	2.4
2	FB	45	0	25	20	35	15	15	75	25	35	10	23	13	0.0	2.2	3.2
3	DS	42	0	35	35	25	25	27	70	19	20	20	18	0.0	0.0	2.0	2.3

Sl. No.	TEC	Una- -ware		Aware		Interest		Evalu ation		Trial		Ado- -ption		Reje- -cted		Adoption Mean Score	
4	D	30	0	45	15	25	18	30	25	20	30	18	80	0.0	0.0	2.1	3.8
5	MG	0	0	45	47	35	40	25	33	20	19	15	17	28	12	2.9	2.6
6	B	0	0	12	55	18	25	25	35	45	28	68	15	0.0	10	3.8	2.4
III Storage Technologies																	
1	JB	0	0	27	30	29	38	15	37	37	30	60	33	0.0	0.0	3.4	3.0
2	R	0	0	20	38	35	20	32	30	43	45	38	35	0.0	0.0	3.2	2.6
3	WH	30	30	35	25	30	28	20	20	25	18	18	20	10	27	2.4	2.8
4	S	30	38	25	20	20	26	15	22	30	29	20	19	28	14	3.0	2.5

Source: Field survey, 2017

Where;

TEC= Technologies ranging from 1-26

Production Technologies

I.S (Improve seed)25kg of FARO 44/ ha; T.P (Time of planting) (June) D. P(Depth of planting) 3-4cm T.D(Touch down) (pre-emergence herbicide) S(Solito) (post emergence herbicides);R.S (Recommended spacing)20cm by 20cm SPH(Seed per hole)4-5 seed P. B (Puddling and bonding FAG (Fertilizer application "granular") first dose (NPK 15: 15: 15: 4 bags); FA (Fertilizer application) second dose (Urea 46:0:0 2bags); W.C (weed control measure) MBS(Methods of bird scaring) WM(Water management)FA (Fertilizer application) "liquid" first dose (NPK 2liters, Boron 2liters; FA(Fertilizer application second dose (Urea liquid 2liters); H. (Harvesting) R.(Recoup) 25%

Processing Technologies

T (Threshers) UFB (Use of False bottom) for per boiling; DS. (Drying slabs) D. (De-stoner) MG. (Measurement gauge)B. Bagging.

Storage Technologies

23. JB (Jute bag) R.(Rhumbus) WH(Ware house) S : Sale 85% to off takers.

Factors Constraining Adoption of *FARO 44* among Respondents

Table 4 shows factor matrix on adoption constraints. Factors base on variable loading were used; four factors were identified and named. Factor one (1) were economic related factors, (2). policy related factor; cultural related factors (3) and attitude related factors (4). Items that loaded high in factor 1, (economics related constraints), included Poor relationship between farmer/facilitator and desk officers (eigen value=.373); Poor monitoring and evaluation (eigen value =.327); Difficulty in raising counterpart fund (eigen value=.354); In ability to recoup 25% of the total harvest (eigen value=.301); Farmers cum herdsmen

clash (eigen value = .302), High cost of false bottom (eigen value=.486);Items that loaded high in factor 2, (policy related constraints), is Untimely delivery of inputs(eigen value= .783). while for cultural related factors were; Transplanting is too tedious (eigen value= .413); poor saving culture (eigen value.335); while for attitude related factors are wide commutation gap between the famers and facilitators (eigen value.796) and Liquid fertilizer not effective (eigen value. 460).

Table 4
Factors Constraining Adoption of *FARO 44* technologies

Sl. No.	Variables	Factor 1	Factor 2	Factor 3	Factor 4	Remarks
1	Business plan not in line with farmers demand	-	-	-.032	.025	D
2	Poor relationship between farmer/ facilitator and desk officers	.373*	.134	.242	.040	S
3	Poor monitoring and evaluation	.327*	.109	.282	.204	S
4	Wide Communication gap between the famers and facilitators	.149	.035	.065	.796*	S
5	Untimely delivery of inputs	.161	.783*	.039	.077	S
6	Germination percentage is low	-.431*	.041	.192	.042	S
7	Difficulty in raising counterpart fund	-.354*	.020	.204	.045	S
8	Liquid fertilizer not effective	-.079	.050	.045	.460*	S
9	Transplanting is too tedious	.164	.066	.413*	.158	S
10	Insufficient rain fall	-.066	-	-.126	-	D
11	Problem of qualee bird	.014	-	.163	-	D
12	Incidence of gall midge	.175	-	.168	-	D
13	Problem of iron toxicity	.290	.0665	.107	-.145	NS
14	Inability to recoup 25% of the total harvest	.301*	.261	.061	-.032	S
15	Low pricing by the off takers	.080	.049	.159	.007	NS
16	Language barrier	.025	.103	.060	.298	NS
17	Poor saving culture	.103	.055	.335*	-.137	S
18	Farmer cum herdsmen clash	.302*	.079	.078	.058	S
19	High cost of milling machine	-	.276	-	.007	D

20	High cost of threshers		.032	.717	-	D
21	Incidence of rodents in the store	.032	.297	.043	.014	NS
22	Wrong view of famers incapable of taking rational decision	.080	-.303	.065	.239	NS
23	High cost of false bottom	.486*	.0400	.163	.107	S

Key: D= Discarded, S=Significant NS= Not significant
Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
**Significant*

CONCLUSION

It is concluded that male farmers attached more value to adoption of production technologies than processing technologies while female respondents had adopted most of the processing technologies than production technologies. Moreso, recommended spacing of 20 cm by 20 cm had the highest percentage (74%) of adoption from the male respondents while *Solito* (post emergence herbicide) had the highest percentage (28%) of rejection from female respondents. Majority of the technologies were at evaluation and trial stages for both male and female respondents. The study recommends strengthening of the communication process among all the stakeholders.

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